

# Understanding Complexities in Emergency Management in Order to Mitigate Cascading Consequences

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*Abstract*— Crisis situations and complex emergencies are very challenging. There is a critical need for rapid decision-making within the time constraints of an ongoing emergency. Extreme events are volatile, change rapidly, and have unpredictable outcomes. Extreme events require a multitude of agencies and organizations to be involved in a response. Different individuals are most likely needed in the many different phases from planning through response and finally recovery. Hundreds of individuals in various roles will have provided some type of expertise, performing analysis and recommending or making decisions for the event in question. Natural disasters do not recognize or stop at either geographical or political boundaries.

Two of the most important aspects of crisis management are complexity and time. The complexity includes unpredictability, multiple coordination among agencies and organizations, and the potential to cascade uncontrollably to create even more problems. This does not aid in the over-arching problem or set of problems. Time is the second aspect of this problem. Decision makers in disasters have minutes to hours to make most decisions. In some instances they have little or no advanced warning to a situation. Complexity is not a friend of rapid, time-constrained situations. Understanding that these issues are different, but directly related to each other is critically important.

A number of tools have been developed for the emergency management community; however, rarely do these tools represent an operator's or practitioner's perspective of how real-world events unfold. Tool developers, analysts and operations personnel rarely come together to discuss these critical issues in the system. Additionally, there is no funding to support these types of collaborative efforts, resulting in a significant capability gap in this system. This gap can be facilitated in the communications process at the core of this problem.

To address this gap, I assert a collaborative effort between the modeling, analysis, and operations communities is needed to understand the complexity of this difficult problem.

Some of the topics that need to be addressed in this collaboration include in order to have a deeper understanding of this problem are:

- The complexity of the emergency response
- Logistics
- Information assurance
- Addressing the concerns and decisions of operations personnel
- Decisive and informed decision making
- Execution of decisions during constrained time events

Multi-tiered disaster problems require intricate assessments and inter-related system solutions promoted by professionals who are respected for their wide-range of knowledge, skills and abilities. We have an obligation to the public to seek out these individuals. We need to tap their extensive subject-matter knowledge in order to understand how these potential scenarios have the ability to cascade and create more problems that end-users must solve on a daily basis.

*Keywords*—*Emergency Management; Complex Systems; Decision Support; Complexity; Disasters*